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Incidence, Risk Factor and Outcome of Delirium in Intensive Care Unit: An Observational Study

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ABSTRACT

Background: Delirium is a frequent neuropsychiatric complication in critically ill patients, particularly in intensive care units (ICUs). It is associated with prolonged hospitalization, increased mortality, and long-term cognitive impairment. Despite its clinical importance, hypoactive delirium often remains underdiagnosed, underscoring the need for systematic evaluation in diverse ICU settings.

Methods: A prospective observational study was conducted over one year in the Medical Intensive Care Unit (MICU) at IMS & SUM Hospital, Bhubaneswar. Adult patients (>18 years) admitted to MICU were screened using the Confusion Assessment Method for the ICU (CAM-ICU) every six hours. Baseline demographic, clinical, and comorbidity data were collected, along with ICU-emergent factors such as mechanical ventilation, sedative exposure, and metabolic derangements. Statistical analysis was performed using chi-square and t-tests, with $p < 0.05$ considered significant.

Results: Among 206 eligible patients, 60 developed delirium, yielding an incidence of 29.12%. Older age, chronic smoking, higher APACHE II and SOFA scores, elevated Charlson Comorbidity Index, and lower Glasgow Coma Scale were significant predisposing factors. Mechanical ventilation, sedative/analgesic use, hyponatremia, and elevated blood urea were major precipitating factors. Delirium was independently associated with prolonged ICU stay and increased mortality.

Conclusion: Delirium affects nearly one-third of MICU patients and is strongly linked to both baseline vulnerabilities and ICU-acquired insults. Routine CAM-ICU screening, judicious sedation practices, correction of metabolic abnormalities, and implementation of interdisciplinary bundles such as ABCDEF are essential to reduce incidence and improve outcomes.

Key-words: ABCDEF bundle, CAM-ICU, Delirium, ICU mortality, Mechanical ventilation, Sedatives, SOFA score

INTRODUCTION

Delirium is a complex neuropsychiatric syndrome characterized by an acute disturbance in consciousness, attention, and cognition that develops over a short duration and fluctuates during the course of the day.

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It is a transient but potentially serious clinical condition commonly seen in critically ill patients admitted to intensive care units (ICUs). Delirium has previously been described by different terms such as ICU psychosis, acute confusional state, acute brain failure, organic brain syndrome, and toxic encephalopathy, reflecting the diverse clinical manifestations and evolving understanding of the condition.[1-3] Delirium is clinically important because it is not only a consequence of critical illness but also an independent predictor of poor patient outcomes. In ICU patients, delirium may present as hyperactive delirium with agitation, restlessness, and

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hallucinations; hypoactive delirium with lethargy, drowsiness, and apathy; or a mixed form showing features of both. Hypoactive delirium is more common and often remains undiagnosed because of its subtle presentation.[2]

The burden of delirium in ICU settings is considerable. Previous studies have reported an incidence ranging from 20% to 83%, depending on patient characteristics, illness severity, and diagnostic methods used.[1,4,5] Patients requiring mechanical ventilation are particularly vulnerable, and the use of sedatives and analgesics further increases the risk.[1,5,6] Peterson *et al.* observed that hypoactive delirium constituted the majority of cases among critically ill patients, whereas pure hyperactive delirium was uncommon.[2] These findings emphasize the importance of regular and systematic screening for delirium in ICU settings.

Delirium is associated with prolonged hospital stay, increased healthcare expenditure, long-term cognitive impairment, higher rates of institutionalization, and increased mortality.[5-8] Previous studies have demonstrated that delirium significantly increases mortality risk among mechanically ventilated ICU patients.[5] In addition, complications such as self-extubation, ventilator asynchrony, and reintubation further increase healthcare burden and ICU resource utilization.[4] Persistent cognitive and functional impairment after discharge also negatively affects the quality of life of ICU survivors.[7,8]

The exact pathophysiology of delirium remains incompletely understood and is believed to be multifactorial. Proposed mechanisms include neurotransmitter imbalance, inflammatory pathways, oxidative metabolic impairment, and structural brain changes.[3,9,10] Reduced cholinergic activity and increased dopamine activity are considered important contributors to delirium development.[9] Systemic inflammation during critical illness may alter blood–brain barrier permeability and impair neurotransmitter signaling. Altered uptake of neutral amino acids such as tryptophan and tyrosine has also been associated with increased delirium risk in critically ill patients.[10,11]

Several predisposing and precipitating factors contribute to delirium development. Predisposing factors include advanced age, baseline cognitive dysfunction, smoking, alcohol use, and multiple comorbid illnesses.[12] ICU-related precipitating factors include infections, hypoxia, metabolic disturbances, mechanical ventilation, sedative exposure, and sleep deprivation.[6,13] Benzodiazepines and opioids have consistently been identified as important pharmacological risk factors. Previous studies have shown that lorazepam exposure significantly increases the risk of transition to delirium among ICU patients.[6]

Recognition of delirium remains challenging, particularly in hypoactive cases. Routine neurological examination alone is often insufficient, making validated screening tools essential for diagnosis.[1,14,15] The Confusion Assessment Method for the ICU (CAM-ICU) is one of the most commonly used bedside tools because of its simplicity, reliability, and applicability in mechanically ventilated patients.[1,14] Other screening instruments include the Intensive Care Delirium Screening Checklist (ICDSC), Nursing Delirium Screening Scale, and NEECHAM Confusion Scale.[15]

Management of delirium includes both non-pharmacological and pharmacological strategies. Environmental modifications, sleep optimization, early mobilization, family engagement, and structured protocols such as the ABCDEF bundle have shown significant benefit in reducing delirium incidence and improving patient outcomes. [16,17] Pharmacological management mainly involves the use of antipsychotic medications such as haloperidol and atypical antipsychotics, while dexmedetomidine has demonstrated advantages over benzodiazepines in reducing delirium occurrence.[18]

Considering the significant impact of delirium on morbidity, mortality, cognitive outcomes, and healthcare utilization, assessment of its incidence and associated risk factors in individual institutional settings is important. In addition, hypoactive delirium frequently remains under-recognized without routine screening protocols. Therefore, the present study was conducted to determine the incidence of delirium among patients admitted to the medical intensive care unit (MICU) and to evaluate the associated risk factors and clinical outcomes.

MATERIALS AND METHODS

Study design, setting, and period- This was a prospective observational study conducted over a period of one year in the Medical Intensive Care Unit (MICU) at IMS & SUM Hospital, Bhubaneswar, a tertiary care teaching hospital

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in Eastern India. The MICU caters to a heterogeneous population of critically ill patients with medical emergencies, making it an appropriate setting to study the burden and determinants of delirium in critically ill adults. The prospective design ensured systematic data collection in real time, minimized recall bias, and allowed the temporal sequence between risk factors and delirium onset to be studied.

Participants (eligibility criteria)- All adult patients admitted to MICU were screened for eligibility.

Inclusion criteria- Patients aged >18 years, admitted to MICU, with proxy consent from relatives.

Exclusion criteria- (i) Patients or caregivers who refused consent, (ii) patients with deafness (due to inability to participate in cognitive testing), and (iii) patients unable to understand Odia, Hindi, or English (since validated tools were only available in these languages).

By restricting inclusion to patients who could reliably undergo assessment, the study maintained methodological rigor and avoided misclassification of delirium. Sample size and sampling approach. Previous studies (e.g., Ely et al.) reported delirium incidence in ICU settings ranging between 20% and 80%, with recent pooled estimates closer to 40%. Based on this, the investigators aimed for an initial sample size of 150 patients, expecting ~60 delirium cases (40%), which would provide adequate statistical power to evaluate approximately 13 independent variables (maintaining ≥10 events per variable for multivariable analysis). Since the desired number of delirium cases was not reached with 150 participants, consecutive enrollment was continued until 60 delirium cases were accrued. This adaptive approach ensured that the study had sufficient cases for robust analysis of risk factors and outcomes. Baseline assessments (predisposing factors). At admission, a standardized form was used to capture baseline demographic and clinical characteristics. These included:

- Age and gender
- Lifestyle factors: smoking history, alcohol intake
- Severity of illness: APACHE II and SOFA scores at admission
- Comorbidity burden: Charlson Comorbidity Index
- Pre-existing psychiatric disorders (history from relatives/records)
- Neurological status: Initial Glasgow Coma Scale (GCS)

These variables represent predisposing risk factors that might increase susceptibility to delirium and were carefully documented to allow multivariate analysis. Delirium screening workflow Every enrolled patient was evaluated within the first 24 hours of MICU admission using the Richmond Agitation-Sedation Scale (RASS) to determine their level of arousal. Patients with RASS −3 or −4 (deeply sedated/unresponsive) were temporarily excluded from delirium screening until arousal improved. Patients with RASS other than −3/−4 underwent delirium screening using the Confusion Assessment Method for the ICU (CAM-ICU), a validated tool with high reliability among non-psychiatrists [1,4,12]. Assessments were performed by a trained anaesthesiologist or intensivist every 6 hours throughout the ICU stay. This frequent monitoring increased detection sensitivity, especially for fluctuating delirium states. Case definition and incidence estimation A patient was classified as a new case of delirium upon their first positive CAM-ICU assessment. Incidence was calculated as the proportion of new delirium cases among all eligible MICU admissions during the study period. Patients were followed until:

- ICU discharge,
- Death, or
- Leaving against medical advice (LAMA).

Patients who left against medical advice were conservatively classified as death equivalents, since subsequent delirium occurrence and outcomes could not be tracked, ensuring a uniform denominator for outcome analysis.

ICU-emergent factors (precipitating factors)- Apart from baseline predisposing factors, the study systematically captured ICU-emergent factors that could precipitate delirium:

- Electrolyte disturbances (lowest sodium during ICU stay)
- Metabolic derangements (highest blood urea)
- Need for mechanical ventilation and duration
- Exposure to sedative/analgesic medications (type, dose, and duration)
- Clinical outcomes (discharge vs. death/LAMA)

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By differentiating between predisposing (baseline) and precipitating (ICU-acquired) factors, the study was able to explore both patient-related vulnerability and iatrogenic/environmental contributions to delirium.

Outcomes- The primary outcome of the study was the incidence of delirium among MICU patients, diagnosed using the Confusion Assessment Method for the Intensive Care Unit (CAM-ICU). Secondary outcomes included evaluation of the phenomenology and risk factors associated with delirium, particularly the relationship of predisposing and precipitating factors with delirium occurrence. In addition, clinical outcomes such as mortality, duration of ICU stay, and discharge status among delirium patients were assessed. This combined approach enabled comprehensive evaluation of both the epidemiological burden and clinical impact of delirium in critically ill patients.

Statistical Analysis- Data were anonymized, double-entered into Microsoft Excel, and analyzed using SPSS version 25. Quantitative variables such as age, APACHE II score, and SOFA score were expressed as mean±standard deviation (SD), whereas categorical variables, including gender, delirium occurrence, and mortality, were presented as frequencies and percentages. Bivariate analysis was performed using the Chi-square test for categorical variables and the independent-samples t-test for continuous variables. A p-value of <0.05 was considered statistically significant. This statistical approach enabled appropriate hypothesis testing while maintaining methodological adequacy for the study sample size.

Ethics and Consent- Approval was obtained from the Institutional Ethics Committee (IEC) before commencement of the study, in compliance with the Declaration of Helsinki and ICMR ethical guidelines. Since many ICU patients are not in a position to provide informed consent due to impaired sensorium, mechanical ventilation, or sedation, the study followed a proxy consent model. Written informed consent was obtained from the patient's legally authorized representatives. Patients who regained capacity were re-consented where feasible. This approach safeguarded ethical standards while ensuring inclusion of critically ill individuals at risk of delirium.

RESULTS

Table 1 shows the overall incidence of delirium among critically ill patients admitted to the MICU during the study period. Among 206 patients fulfilling the inclusion criteria, 60 patients developed delirium, resulting in an overall incidence of 29.12%. The findings indicate that delirium represents a common neuropsychiatric complication in critically ill patients.

Table 1: Incidence of Delirium among MICU Patients

Parameter	Total Patients (n)	Patients with Delirium (n)	Incidence (%)
Total MICU admissions	206	60	29.12

Table 2 presents the relationship between baseline demographic and predisposing factors with delirium occurrence. Increasing age and smoking history showed significant association with delirium development, whereas gender, alcohol intake, and previous psychiatric illness were not significantly associated. These findings suggest that advanced age and smoking may increase susceptibility to acute cognitive dysfunction in critically ill patients.

Table 2: Association of Baseline Characteristics with Delirium

Variable	Delirium (n=60)	No Delirium (n=146)	p-value
Mean Age (years)	↑ (Older)	Lower	<0.05*
Male: Female	Similar ratio	Similar ratio	NS
Smoking history (%)	Higher	Lower	<0.05*
Alcohol history (%)	Similar	Similar	NS
Previous psychiatric illness (%)	Similar	Similar	NS

**NS = Not significant; *p < 0.05 significant*

Table 3 compares severity indices and neurological parameters between delirium and non-delirium groups. Patients who developed delirium had significantly higher APACHE II scores, SOFA scores, and Charlson Comorbidity Index values, along with lower Glasgow Coma Scale scores at admission.

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The findings indicate that greater disease severity, increased comorbidity burden, and impaired baseline neurological status contribute significantly to delirium risk.

Table 3: Severity Scores and Comorbidity Indices in Relation to Delirium

Clinical Variable	Delirium (Mean ± SD)	No Delirium (Mean ± SD)	p-value
APACHE II Score	Higher	Lower	<0.05*
SOFA Score	Higher	Lower	<0.05*
Charlson Comorbidity Index	Higher	Lower	<0.05*
Initial Glasgow Coma Scale (GCS)	Lower	Higher	<0.05*

Table 4 demonstrates the association of ICU-related precipitating factors and metabolic derangements with delirium occurrence. Mechanical ventilation, sedative and analgesic exposure, elevated blood urea levels, and hyponatremia were significantly associated with delirium development. These findings highlight the important role of ICU interventions and metabolic disturbances in precipitating delirium among critically ill patients.

Table 4: ICU-Emergent Precipitating Factors for Delirium

Factor	Delirium Group	Non-Delirium Group	p-value
Mechanical ventilation	Significantly ↑	Lower	<0.05*
Sedative/Analgesic use	Significantly ↑	Lower	<0.05*
Urea (mg/dL)	Higher	Lower	<0.05*
Sodium (mEq/L)	Lower	Normal/Higher	<0.05*

Table 5 summarizes the major clinical outcomes associated with delirium in MICU patients. Patients who developed delirium experienced prolonged ICU stay and significantly higher mortality compared to patients without delirium. The findings emphasize that delirium is strongly associated with adverse clinical outcomes and poor prognosis in critically ill populations.

Table 5: Clinical Outcomes of Delirium among MICU Patients

Outcome	Delirium (n=60)	No Delirium (n=146)	p-value
Mean ICU stay (days)	Longer	Shorter	<0.05*
Mortality (%)	Higher	Lower	<0.05*
Discharged alive (%)	Lower	Higher	<0.05*
Left against medical advice†	Counted as death	–	–

† LAMA cases were considered as deaths for analysis.

Fig. 1 demonstrates the overall incidence of delirium among patients admitted to the MICU during the study period. Out of 206 critically ill patients included in the study, 60 patients developed delirium, giving an overall incidence of 29.12%. The Fig. highlights the substantial burden of delirium in critically ill populations and emphasizes the importance of routine screening and early intervention strategies in ICU settings.

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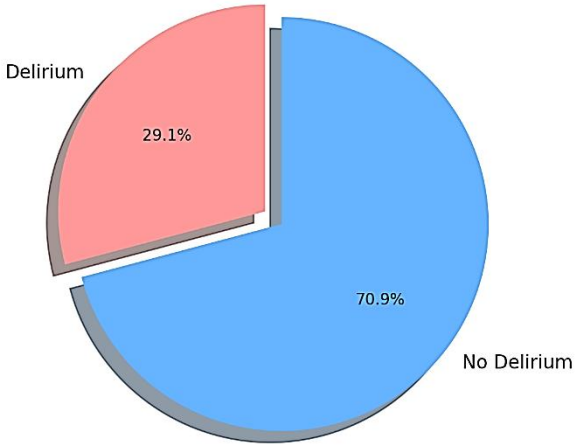

Fig. 1: Incidence of Delirium among MICU Patients

Fig. 2 illustrates the comparison of APACHE II score, SOFA score, Charlson Comorbidity Index, and Glasgow Coma Scale (GCS) between delirium and non-delirium groups. Patients who developed delirium had significantly higher APACHE II, SOFA, and Charlson Comorbidity Index scores, along with lower GCS at admission. These findings indicate that increased disease severity, higher comorbidity burden, and impaired neurological status are strongly associated with delirium development in critically ill patients.

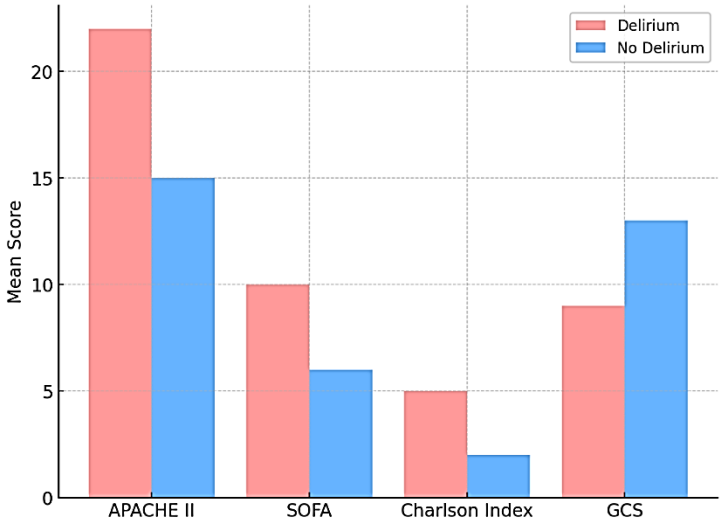

Fig. 2: Severity Scores and Baseline Neurological Status in Delirium Patients

Fig. 3 depicts the major clinical outcomes associated with delirium among MICU patients. Patients with delirium had significantly prolonged ICU stay and higher mortality compared to non-delirious patients. The Fig. demonstrates that delirium is not only associated with the severity of illness but also acts as an independent predictor of adverse clinical outcomes and poor prognosis in critically ill patients.

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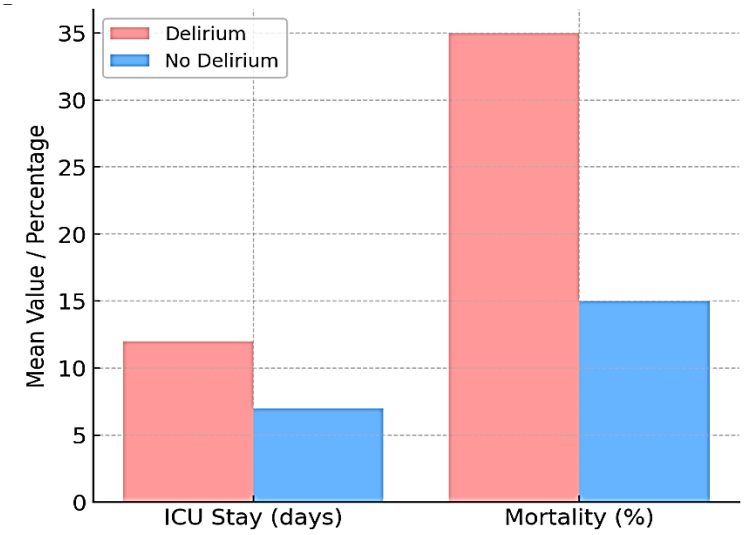

Fig. 3: Clinical Outcomes of Delirium in MICU Patients

DISCUSSION

Delirium is a serious but frequently under-recognized neuropsychiatric complication among critically ill patients admitted to intensive care units. Although it is considered an acute and potentially reversible disorder, delirium has significant effects on patient outcomes, including increased morbidity, mortality, prolonged ICU stay, and long-term cognitive impairment. In the present study, the incidence of delirium among MICU patients was 29.12%. Delirium was significantly associated with advanced age, smoking, higher APACHE II and SOFA scores, increased comorbidity burden, lower GCS score, mechanical ventilation, sedative and analgesic exposure, hyponatremia, and elevated blood urea levels. Patients who developed delirium also had longer ICU stay and increased mortality, emphasizing its prognostic importance.

Despite its clinical significance, delirium often remains undetected in ICU settings, particularly the hypoactive subtype. Hyperactive delirium characterized by agitation and restlessness, is more easily recognized, whereas hypoactive delirium presents with lethargy, drowsiness, and reduced responsiveness, making diagnosis more difficult.[19] Peterson *et al.* reported that hypoactive delirium constituted the majority of delirium cases among critically ill patients, while pure hyperactive delirium was uncommon.[19] Failure to identify hypoactive delirium may lead to delayed management and worsening clinical outcomes. Previous studies have also shown that delirium is associated with persistent cognitive dysfunction, functional decline, and increased rates of institutionalization after discharge.[20,21]

These observations highlight the importance of routine delirium screening using validated bedside tools such as CAM-ICU in critically ill patients.[1,14,15]

The incidence of delirium observed in the present study was comparable to previously reported ICU-based studies showing rates between 20% and 40%.[1,5,18] Variations in incidence across studies may be attributed to differences in patient populations, severity of illness, sedation practices, and diagnostic criteria used. Earlier studies demonstrated that delirium in mechanically ventilated patients was independently associated with prolonged hospitalization and increased mortality.[5,18] Similar findings were observed in our study, where patients with delirium had longer ICU stay and poorer clinical outcomes. These findings suggest that delirium is not merely a manifestation of critical illness but an independent predictor of adverse outcomes.

Advanced age was identified as an important predisposing factor for delirium in the present study. Elderly patients are more vulnerable because of reduced cerebral reserve, neurotransmitter imbalance, and greater susceptibility to metabolic and inflammatory stress.[9,22,23] Smoking was also significantly associated with delirium, possibly because of vascular dysfunction and oxidative stress contributing to impaired neuronal function. Higher APACHE II and SOFA scores, along with increased Charlson comorbidity index, were strongly associated with delirium development, indicating that severity of illness and comorbidity burden play a major role in the pathogenesis of ICU delirium.

Mechanical ventilation and sedative exposure were major precipitating factors observed in our study. Similar

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observations have been reported previously, where benzodiazepines and sedatives significantly increased the risk of delirium among ICU patients.[10,13,24] Pandharipande et al. demonstrated that lorazepam exposure independently increased the risk of transition to delirium in critically ill patients.[10] Sedative-induced coma and prolonged ventilator support have also been associated with increased delirium risk.[24] These findings support the importance of minimizing unnecessary sedation and adopting light sedation protocols in ICU practice.[25]

Metabolic abnormalities also contributed significantly to delirium development in the present study. Hyponatremia and elevated blood urea levels were significantly associated with delirium, which is consistent with previous evidence linking metabolic disturbances and uremic encephalopathy with acute brain dysfunction.[3,6,8] Correction of electrolyte imbalance and optimization of metabolic parameters may therefore help reduce delirium risk in critically ill patients.

The present study also demonstrated that delirium was associated with higher mortality and prolonged ICU stay. Previous studies have similarly shown that delirium independently increases mortality risk among ICU patients.[5,18] Long-term cognitive impairment and poor quality of life following ICU discharge have also been reported among delirium survivors.[20,21] These findings reinforce the importance of early recognition and preventive strategies in ICU settings.

The clinical importance of delirium lies in its potentially preventable nature. Early mobilization, minimizing sedative exposure, maintaining sleep hygiene, optimizing metabolic status, and implementation of structured care bundles may significantly reduce delirium incidence and improve patient outcomes.[16,25] Routine use of validated screening tools such as CAM-ICU enables early identification and timely management of delirium, even among mechanically ventilated patients.[1,4,12-15] A multidisciplinary approach involving intensivists, psychiatrists, nursing staff, and respiratory therapists is essential for effective delirium prevention and management.

The present study has certain strengths and limitations. The prospective design and use of validated delirium assessment tools allowed systematic evaluation of risk factors and outcomes. Continuous monitoring reduced the possibility of missing fluctuating delirium episodes. However, being a single-center study, generalizability may be limited. Baseline cognitive assessment and inflammatory biomarkers were not included, which may have provided additional insights regarding pathophysiology. Despite these limitations, the findings are consistent with previous literature and contribute valuable data regarding delirium among MICU patients.

Further multicentric studies with larger sample sizes are needed to better evaluate the epidemiology, pathophysiology, and long-term outcomes of delirium in critically ill patients. Future research should also focus on biomarker-based assessment and evaluation of preventive intervention strategies in ICU settings.

CONCLUSIONS

Delirium affects nearly one-third of MICU patients in our study, with significant associations to both predisposing factors (older age, smoking, higher severity scores, comorbidity burden, lower GCS) and precipitating ICU factors (mechanical ventilation, sedatives, electrolyte and metabolic derangements). Importantly, it was linked to prolonged ICU stay and higher mortality, confirming it as an independent predictor of adverse outcomes. Our findings emphasize that delirium should not be viewed as an inevitable consequence of critical illness but as a preventable and modifiable complication. Routine CAM-ICU screening, judicious use of sedatives, correction of metabolic abnormalities, and interdisciplinary bundles like ABCDEF can mitigate risk and improve survival. Addressing delirium must therefore be prioritized in ICU protocols, not only to improve patient outcomes but also to reduce healthcare costs and long-term disability.

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Final approval- , Jyotirmayee Dash

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REFERENCES

[1] Ely EW, Inouye SK, Bernard GR, Gordon S, Francis J, et al. Delirium in mechanically ventilated patients: validity and reliability of the confusion assessment method for the intensive care unit (CAM-ICU). JAMA., 2001; 286(21): 2703-10.

[2] Ely EW, Shintani A, Truman B, Speroff T, Gordon SM, et al. Delirium as a predictor of mortality in mechanically ventilated patients in the intensive care unit. JAMA., 2004; 291(14): 1753-62.

[3] Thomason JW, Shintani A, Peterson JF, Pun BT, Jackson JC, et al. Intensive care unit delirium is an independent predictor of longer hospital stay: a prospective analysis of 261 non-ventilated patients. Crit Care., 2005; 9(4): R375-81.

[4] Peterson JF, Pun BT, Dittus RS, Thomason JW, Jackson JC, et al. Delirium and its motoric subtypes: a study of 614 critically ill patients. J Am Geriatr Soc., 2006; 54(3): 479-84.

[5] Girard TD, Jackson JC, Pandharipande PP, Pun BT, Thompson JL, et al. Delirium as a predictor of long-term cognitive impairment in survivors of critical illness. Crit Care Med., 2010; 38(7): 1513-20.

[6] van den Boogaard M, Schoonhoven L, Evers AW, van der Hoeven JG, van Achterberg T, et al. Delirium in critically ill patients: impact on long-term health-related quality of life and cognitive functioning. Crit Care Med., 2012; 40(1): 112-18.

[7] McNicoll L, Pisani MA, Ely EW, Gifford D, Inouye SK. Delirium in the intensive care unit: occurrence and clinical course in older patients. J Am Geriatr Soc., 2003; 51(5): 591-98.

[8] Hshieh TT, Fong TG, Marcantonio ER, Inouye SK. Cholinergic deficiency hypothesis in delirium: a synthesis of current evidence. J Gerontol A Biol Sci Med Sci., 2008; 63(7): 764-72.

[9] Pandharipande PP, Morandi A, Adams JR, Girard TD, Thompson JL, et al. Plasma tryptophan and tyrosine levels are independent risk factors for delirium in critically ill patients. Intensive Care Med., 2009; 35(11): 1886-92.

[10] Robinson TN, Raeburn CD, Angles EM, Moss M. Low tryptophan levels are associated with postoperative delirium in the elderly. Am J Surg., 2008; 196(5): 670-74.

[11] Engel GL, Romano J. Delirium, a syndrome of cerebral insufficiency. J Neuropsychiatry Clin Neurosci., 2004; 16(4): 526-38.

[12] Pandharipande P, Shintani A, Peterson J, Pun BT, Wilkinson GR, et al. Lorazepam is an independent risk factor for transitioning to delirium in intensive care unit patients. Anesthesiology., 2006; 104(1): 21-26.

[13] Dubois MJ, Bergeron N, Dumont M, Dial S, Skrobik Y. Delirium in an intensive care unit: a study of risk factors. Intensive Care Med., 2001; 27(8): 1297-304.

[14] Marcantonio ER, Juarez G, Goldman L, Mangione CM, Ludwig LE, et al. The relationship of postoperative delirium with psychoactive medications. JAMA., 1994; 272(19): 1518-22.

[15] Quimet S, Kavanagh BP, Gottfried SB, Skrobik Y. Incidence, risk factors and consequences of ICU delirium. Intensive Care Med., 2007; 33(1): 66-73.

[16] Ely EW, Margolin R, Francis J, May L, Truman B, et al. Evaluation of delirium in critically ill patients: validation of the confusion assessment method for the intensive care unit (CAM-ICU). Crit Care Med., 2001; 29(7): 1370-79.

[17] van Eijk MM, van Marum RJ, Klijn IA, de Wit N, Kesecioglu J, et al. Comparison of delirium assessment tools in a mixed intensive care unit. Crit Care Med., 2009; 37(6): 1881-85.

[18] van Eijk MM, van den Boogaard M, van Marum RJ, Benner P, Eikelenboom P, et al. Routine use of the confusion assessment method for the intensive care unit: a multicentre study. Am J Respir Crit Care Med., 2011; 184(3): 340-44.

[19] Vasilevskis EE, Morandi A, Boehm L, Pandharipande PP, Girard TD, et al. Delirium and sedation recognition using validated instruments: reliability of bedside intensive care unit nursing assessments from 2007 to 2010. J Am Geriatr Soc., 2011; 59(Suppl 2): S249-55.

[20] Van Rompaey B, Elseviers MM, Van Drom W, Fromont V, Jorens PG. The effect of earplugs during the night on the onset of delirium and sleep perception: a randomized controlled trial in intensive care patients. Crit Care., 2012; 16(3): R73.

[21] Girard TD, Kress JP, Fuchs BD, Thomason JW, Schweickert WD, et al. Efficacy and safety of a paired sedation and ventilator weaning protocol for

doi: 10.21276/SSR-IIJLS.2026.12.3.27

mechanically ventilated patients in intensive care. Lancet., 2008; 371(9607): 126-34.

[22]Ely EW, Truman B, Shintani A, Thomason JW, Wheeler AP, et al. Monitoring sedation status over time in ICU patients: reliability and validity of the Richmond Agitation-Sedation Scale (RASS). JAMA., 2003; 289: 2983-91.

[23]Van Rompaey B, Schuurmans MJ, Shortridge-Baggett LM, Truijen S, Bossaert L. Risk factors for intensive care delirium: a systematic review. Intensive Crit Care Nurs., 2008; 24(2): 98-107.

[24]Flacker JM, Cummings V, Mach JR Jr, Bettin K, Kiely DK, et al. The association of serum anticholinergic activity with delirium in elderly medical patients. Am J Geriatr Psychiatry., 1998; 6(1): 31-41.

[25]Van Rompaey B, Schuurmans MJ, Shortridge-Baggett LM, Truijen S, Elseviers M, et al. A comparison of the CAM-ICU and the NEECHAM Confusion Scale in intensive care delirium assessment: an observational study in non-intubated patients. Intensive Crit Care Nurs., 2008; 24(5): 301-10.